



OSAC RESEARCH NEEDS ASSESSMENT FORM

Title of research need:

Assessment of the value of activity level factors during investigative processes and interpretation of glass evidence (e.g., mechanisms of transfer and persistence of glass, random occurrence of glass in a random population)

Keyword(s):

Glass, random occurrence, reconstruction, activity factors, transfer and persistence

Submitting subcommittee(s):

Materials/Trace

Date Approved:

9/24/18

(If SAC review identifies additional subcommittees, add them to the box above.)

Background Information:

1. Description of research need:

The use of broken glass as physical evidence is well established in the criminal justice system, as is commonly left behind in the form of trace material in kidnappings, robberies, assaults and hit and run cases. Consensus-based standards, research studies, and peer-reviewed literature have laid the foundations of the discipline, particularly for the analysis and conclusions regarding source/class attribution.

Nonetheless, current challenges remain on its use during investigative stages and on the overall assessment of the value of the evidence beyond the source level to the activity framework.

The application of more comprehensive interpretation models is currently limited due to: a) the need to increase and maintain databases, b) gaps of information regarding the mechanisms of transfer and persistence of glass, and c) lack of studies on the random occurrence of glass in U.S. populations. Although some efforts have been conducted with regards to databases and persistence of glass, there are no studies that report baseline data of traces of glass in the United States. In the absence of local data regarding the prevalence of glass fragments on the general public—relative to those involved in an alleged event—the use of glass in our courts would not be used to its full potential.

2. Key bibliographic references relating to this research need:

1. ASTM E1967-11a Standard Test Method for the Automated Determination of Refractive Index of Glass Samples Using the Oil Immersion Method and a Phase Contrast Microscope, ASTM International, Vol 14.02
2. ASTM E2330-12. Standard Test Method for Determination of Concentrations of Elements in Glass Samples Using Inductively Coupled Plasma Mass Spectrometry (ICP-MS) for Forensic Comparisons, ASTM International, Vol 14.02
3. ASTM E2926-17. Standard Test Method for Forensic Comparison of Glass Using Micro X-ray Fluorescence (μ -XRF) Spectrometry, ASTM International, Vol 14.02
4. ASTM E2927-16. Standard Test Method for Determination of Trace Elements in Soda Lime Glass Samples Using Laser Ablation Inductively Coupled Plasma Mass Spectrometry for Forensic Comparisons, ASTM International, Vol 14.02

5. Caddy, B. *Forensic Examination of Glass and Paint, Analysis and Interpretation*. 1st ed, CRC Press Boca Raton FL, 2002.
6. Coulson SA, Buckleton JS, Gummer AB, Triggs CM. Glass on clothing and shoes of members of the general population and people suspected of breaking crimes. *Science & Justice* 41(1), 2001, 39–48.
7. Curran JM, Hicks TN, Buckleton JS. *Forensic interpretation of glass evidence*. Taylor & Francis, 2000.
8. Curran JM, Triggs CM, Buckleton JS, Walsh KAJ, Hicks T. Assessing transfer probabilities in a Bayesian interpretation of forensic glass evidence. *Science & Justice* 38(1), 1998, 15–21.
9. Curran, J. M., Triggs, C. M., Almirall, J. R., Buckleton, J. S., and Walsh, K. A. J., “The interpretation of elemental composition measurements from forensic glass evidence: I,” *Science and Justice*, Vol. 37, 1997, pp. 241-244.
10. Daeid NN, McColl D, Ballany J. The level of random background glass recovered from fleece jackets of individuals who worked in Law enforcement or related professions. *Forensic Sci Intl* 191(1-3), 2009, 19–23.
11. Davis RJ, DeHaan JD. A Survey of Men's Footwear. *J Forensic Sci Soc* 17, 1977, 271–85.
12. Evett IW, Buckleton J. The interpretation of glass evidence: A practical approach. *Journal of the Forensic Science Society*, Vol. 30, 1990, 215-223.
13. Garvin EJ, Koons RD. Evaluation of match criteria used for the comparison of refractive index of glass fragments,” *Journal of Forensic Sciences*, Vol. 56, 2011, pp. 491-500.
14. Harrison PH, Lambert JA, Zoro JA. A survey of glass fragments recovered from clothing of persons suspected of involvement in crime. *Forensic Sci Intl* 27, 1985, 171–80.
15. Jackson F, Maynard P, Cavanagh-Steer K, Dusting T, Roux C. A survey of glass found on the headwear and head hair of a random population vs. people working with glass. *Forensic Sci Intl* 226(1-3), 2013, 125–31.
16. Lambert JA, Satterthwaite MJ, Harrison PH. A survey of glass fragments recovered from clothing of persons suspected of involvement in crime. *Science & Justice* 35 (4), 1995, 273–81.
17. Lau L, Beveridge AD, Callowhill BC, Connors N, Foster K, Groves RJ, et al. The Frequency of Occurrence of Paint and Glass on the Clothing of High School Students. *Canadian Society of Forensic Sci J* 30(4), 1997, 233–40.
18. McQuillan J, Edgar K. A survey of the distribution of glass on clothing. *J Forensic Sci Soc* 32(4), 1992, 333–48.
19. O'Sullivan S, Geddes T, Lovelock TJ. The migration of fragments of glass from the pockets to the surfaces of clothing. *Forensic Sci Intl* 208(1-3), 2011, 149–55.
20. Pearson EF, May RW, Dabbs M. Glass and paint fragments found in men's outer clothing—report of a survey. *J Forensic Sci Soc*, 16, 1971, 283–99.
21. Petterd CI, Hamshere J, Stewart S, Brinch K, Masi T, Roux C. Glass particles in the clothing of members of the public in south-eastern Australia – a survey. *Forensic Sci Intl* 103(3), 1999, 193–8.
22. Robertson B, Vignaux GA, Berger CEH. *Interpreting Evidence: Evaluating Forensic Science in the Courtroom*, 2nd ed. John Wiley & Sons, 2016
23. Roux C, Kirk R, Benson S, Van Haren T, Petterd CI. Glass particles in footwear of members of the public in South-eastern Australia - a survey. *Forensic Sci Intl* 116(2-3), 2001, 149–56.
24. Walsh KA, Buckleton J, Triggs CM. A practical example of the interpretation of glass evidence. *Science and Justice*, Vol. 36, 1996, 213-218.
25. Zadora G, Ramos D. Evaluation of glass samples for forensic purposes — An application of likelihood ratios and an information-theoretical approach. *Chemometrics and Intelligent Laboratory Systems* 2010;102(2), 63–83.

3a. In what ways would the research results improve current laboratory capabilities?

Glass background surveys have been conducted only outside the U.S., and the existing literature suggests several geographical and socioeconomic factors influence the conclusions that can be inferred from the studies.

At the moment, most U.S. crime laboratories limit the use of glass evidence to the comparison of known and questioned glass fragments to make inferences at the source level. Research studies that generate data on background occurrence of glass on U.S. populations and that evaluate factors that could influence the transfer and persistence of glass will offer the criminal justice a valuable body of knowledge and provide a broader contribution to investigative efforts and a more comprehensive assessment of the evidential value of glass in court.

3b. In what ways would the research results improve understanding of the scientific basis for the subcommittee(s)?

At the subcommittee level, these type of research would provide additional support to the interpretation and report writing guidelines that are being developed for glass evidence and trace materials in general.

3c. In what ways would the research results improve services to the criminal justice system?

Having new foundations of activity factors and baseline occurrence of glass would provide investigators, forensic examiners, defense and prosecutors, judges and jury with tools for a more overarching use of glass to assist in the judicial process.

4. Status assessment (I, II, III, or IV):

I

	Major gap in current knowledge	Minor gap in current knowledge
No or limited current research is being conducted	I	III
Existing current research is being conducted	II	IV

This research need has been identified by one or more subcommittees of OSAC and is being provided as an informational resource to the community.

Approvals:

Subcommittee

Approval date:

9/24/18

(Approval is by majority vote of subcommittee. Once approved, forward to SAC.)

SAC

1. Does the SAC agree with the research need? Yes No

2. Does the SAC agree with the status assessment? Yes No

If no, what is the status assessment of the SAC:

Approval date: 12/19/18

(Approval is by majority vote of SAC. Once approved, forward to NIST for posting.)